Outcomes Following Exploratory Burr Holes for Traumatic Brain Injury in a Resource-Poor Setting

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Introduction

Traumatic brain injury (TBI) is a leading cause of death and disability worldwide. Low- and middle-income countries (LMICs) suffer from a high incidence of and mortality from TBI. Computed tomography (CT) scan is the diagnostic method of choice, but is often inaccessible in LMICs, where exploratory burr holes (EBH) remain a necessary diagnostic and therapeutic procedure. We sought to describe indications and outcomes of patients undergoing EBH at our sub-Saharan African tertiary care center.

Methods

We performed a retrospective review of prospectively collected data at Kamuzu Central Hospital (KCH) in Lilongwe, Malawi. All trauma patients presenting between June 2012 and July 2015 with a deteriorating level of consciousness and localizing signs who underwent EBH were included. Additionally, we included all patients admitted with TBI, requiring higher-level care during 2011. Because there was no neurosurgeon on staff in 2011, no patients underwent EBH. We performed logistic regression to identify predictors of mortality in the total population of TBI patients.

Results

241 patients presented to KCH with TBI requiring higher-level care, with a total mortality of 16.4% (Table 1). 163 (68%) underwent EBH. Of patients that underwent EBH, 87.6% of patients had intraoperative findings, with subdural hematoma being the most common (51.2%). Mortality in patients who underwent EBH was 6.8%. In surviving patients who underwent exploratory burr hole, 71.1% had a favorable outcome, defined as good recovery or moderate disability on the Glasgow Outcome Scale. Mortality in patients that did not undergo EBH was 43.9%.

Upon logistic regression adjusted for age, sex, and Glasgow Coma Score (Table 2), not undergoing EBH significantly increased the odds of mortality (OR=12.0, p=0.000, 95% CI=4.48-31.9).

Conclusions

EBH remain an important diagnostic and therapeutic procedure for TBI in LMICs. In low-resource settings, EBH technique should be incorporated into general surgery education to attenuate TBI-related mortality.

Learning Objectives

By the conclusion of this session, participants should be able to

1. Understand the global burden of TBI and the disproportionate incidence and rate of mortality in low-income countries

2. Identify predictors of mortality among TBI patients in one sub-Saharan African tertiary care center

3. Consider the benefits and disadvantages of incorporating exploratory burr holes into surgical education in low-income settings.

References

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Table 2

Variable	Odds Ratio	P-Value	95% Confidence Interval
Age	1.02	0.117	0.994-1.05
Female Sex	0.64	0.528	0.158-2.58
GCS	0.82	0.006	0.716-0.946
Exploratory Burr Holes Placed	0.08	0.000	0.031-0.222
Exploratory Burr Holes Not Placed	12.0	0.000	4.48-31.8

Table 2: Logistic Regression. Odds of Mortality, adjusted for age, sex, GCS, and placement of EBH.

Odds of Mortality by Logistic Regression

Table 1

Patient Characteristics	All TBI Patients Requiring HDU/ICU Admission (n=241)	Patients Who Underwent Exploratory Burr Hole (n=163)	Patients Who Did Not Undergo Exploratory Burr Hole (n=78)	P-Value
Age (years)	27.5 ± 15.1	26.4±14.4	29.9±16.9	0.099
Sex				0.068
Male	197 (83.5%)	125 (80.1%)	70 (89.7%)	
Female	39 (16.5%)	31 (19.9%)	8 (10.3%)	
Mechanism of Injury				0.000
Assault	47 (19.7%)	37 (22.7%)	10 (13.2%)	
Fall	35 (14.5%)	26 (16.0%)	9 (11.8%)	
RTA	132 (55.2%)	81 (49.7%)	51 (67.1%)	
Unknown/Other	25 (10.5%)	19 (11.7%)	6 (7.9%)	
Glasgow Coma Score at Admission	8.7±3.1	8.2±0.2	10.1±.58	0.000
Overall Mortality	36 (16.4%)	11 (6.8%)	25 (43.9%)	0.000

Table 1: Patient Characteristics by EBH Intervention

Patient Characteristics by EBH Intervention